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BUCKLING EFFECTS OF COMPOSITE PLATE

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Abstract

There have been numerous studies on the composite laminated structures which find many applications in many engineering fields namely aerospace, biomedical, civil, marine and mechanical engineering because of their ease of handling, good mechanical properties and low fabrication cost. They also possess excellent damage tolerance and impact resistance. The mechanical behavior of composite structures is of particular interest to engineers in modern technology. The present buckling analysis of composite plates determined experimentally and the results thus characterized for particular construction purposes

1. Introduction

Fiber reinforced composites are being increasingly used in the aerospace industry because of their properties, namely high specific strength, high specific stiffness and low specific density which reduce the overall operational cost. They are subjected to environmental conditions during their service life. In contrast to transverse loads, they often lose stability at fairly low stress level, when subjected to in-plane forces. So, the buckling behavior of laminated composite plates subjected to hygrothermal environments are of tremendous technical importance for understanding the behavior of laminated composite plates subjected to plane loads. Plenty of studies are available on buckling behavior of composite plates under ambient temperature and moisture conditions. Tauchert [1] reviewed the previous works on buckling and post buckling characteristics associated with elevated temperatures of thin and moderately thick plates having various plan forms and support conditions through 1991. Whitney and Ashton [2] studied the thermal buckling of symmetrically laminated plates with simply supported edges using a generalized Duhamel-Newmann form of Hooke's law. Sai Ram and Sinha [3] investigated the effects of moisture and temperature on the buckling of laminated composite plates using finite element method. Noor and Burton [4] presented analytically the three-dimensional solutions for the free vibrations and buckling of thermally stressed multilayered angle-ply composite plates. Babu and Kant [5] proposed with a refined higher order finite element models for thermal buckling of laminated composite and sandwich plates.
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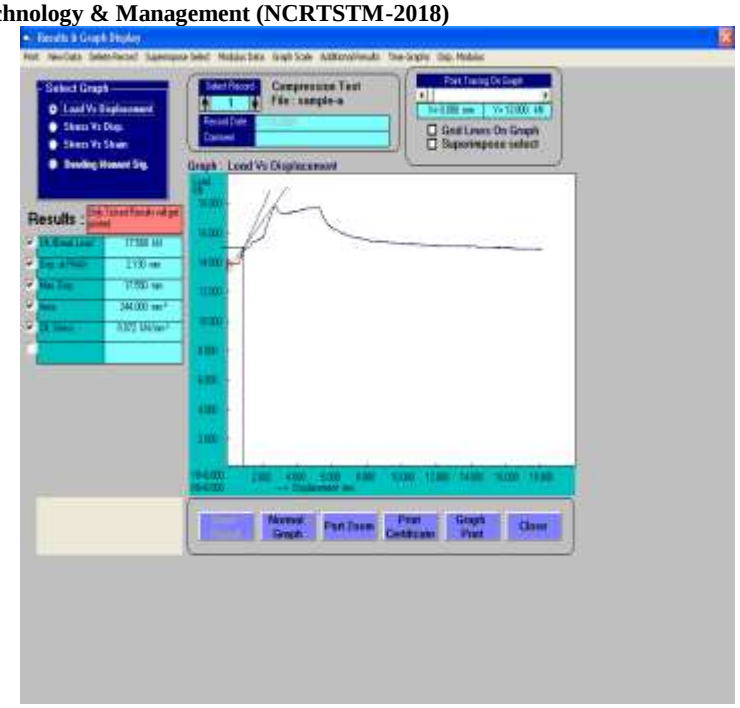
2. EXPERIMENTAL SET UP

To meet the wide range of needs which may be required in fabricating composites, the industry has evolved over a dozen separate manufacturing processes as well as a number of hybrid processes. Each of these processes offers advantages and specific benefits which may apply to the fabricating of composites. Hand lay-up and spray-up are two basic moulding processes. The hand lay-up process is the oldest, simplest, and most labour intense fabrication method. The process is most common in FRP marine construction. In hand lay-up method liquid resin is placed along with reinforcement (woven glass fiber) against finished surface of an open mould. Chemical reactions in the resin harden the material to a strong, light weight product. The resin serves as the matrix for the reinforcing glass fibers, much as concrete acts as the matrix for steel reinforcing rods. The percentage of fiber and matrix was 50:50 in weight.

(Fig.5.a) Glass fiber

(fig. 5.b) Plate casting

Contact moulding in an open mould by hand lay-up was used to combine plies of WR in the prescribed sequence. A flat plywood rigid platform was selected. A plastic sheet was kept on the plywood platform and a thin film of polyvinyl alcohol was applied as a releasing agent by use of spray gun. Laminating starts with the application of a gel coat (epoxy and hardener) deposited on the mould by brush, whose main purpose was to provide a smooth external surface and to protect the fibers from direct exposure to the environment.



RESULTS

DISCUSSION

The results obtain for the above test is 70Kn which will be at par to results obtain in numerical MATLAB programme 72kN.The results are very accurate and solve the plates from buckling of prefab structures

Acknowledgments

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